

MEETING SUMMARY

TO: Attendees:
Nick Aumen/ENP
George Schardt/ENP
Holly Andreotta/SFWMD
Megan Jacoby/SFWMD
Cheol Mo/SFWMD
Vyke Osmondson/SFWMD
Sherry Scott/SFWMD
Matt Harwell/USFWS
Tiffany Trent/USFWS
Mike Waldon/USFWS
Fabian Kahn/ENP
Russ Frydenborg/FDEP
Nikola Dzamov/SFWMD
Kristin Larson/SFWMD
John Moorman/SFWMD
George Paluga/SFWMD
Bob Stickler/SFWMD
Serena Rinker/USFWS
Bill Miller/USFWS
Donatto Surratt/USFWS
Fred Mindermann/ENP
Joe Albers/SFWMD
Delia Ivanoff/SFWMD
Pam Lehr/SFWMD
Kevin Nicholas/SFWMD
Nathan Ralph/SFWMD
Manuel Zamorano/SFWMD
Robert Smith/USFWS
Mark Barrett/USFWS

CC: Garth Redfield/SFWMD
Juli LaRock/SFWMD

FROM: Delia Ivanoff
Pam Lehr

DATE: October 6, 2005

SUBJECT: Marsh Sampling Workshop on September 26, 2005

A 1-day public workshop was held on Monday, September 26, 2005, at the Arthur R. Marshall Loxahatchee Wildlife National Refuge (Refuge), to discuss marsh sampling protocols. During the morning session, South Florida Water Management District (SFWMD or District), Refuge, and Everglades National Park (ENP) personnel, directly involved with marsh field sampling collection, participated in an on-site and hands-on training exercise. The training was led by Russ Frydenborg (Florida Department of Environmental Protection [FDEP]), Kristin Larson (District), and George Paluga (District). Airboats were provided by the Refuge and District to transport participants to the training site. The afternoon session was held in the visitor center auditorium and included a detailed discussion of sampling procedures and potential improvements. The purpose of this workshop was to provide hands-on training on marsh sampling protocols to ensure collection of representative samples and minimize data variability. This memorandum presents discussion highlights and action items identified during the afternoon session of the workshop. If you have any questions or concerns, please contact Delia Ivanoff (561/682-2681 or divanoff@sfwmd.gov) or Pam Lehr (561/ 682-2473 or plehr@sfwmd.gov).

Agenda

An agenda and various handouts were distributed prior to the meeting. The following agenda items were discussed:

- Marsh Sampling Protocol (Russ Frydenborg)
- Current Monitoring Plan and QA/QC Requirements (Joe Albers/John Moorman)
- Challenges and Difficulties in Sample Collection (Matt Harwell/Kristin Larson)
- Open Discussion on Improvement Areas and SOP Refinements (All)
- Public Comments

Attendees

A total of 29 attendees representing the District, FDEP, the U.S. Fish and Wildlife Service (USFWS), and ENP participated in the marsh sampling workshop. Contact information for all attendees is summarized in Table 1.

Table 1. Contact Information for Marsh Sampling Workshop Attendees

Name	Agency	Phone No.	Email Address	On-site (morning session)	Discussion (afternoon session)
Nick Aumen	ENP	561/735-6001	nick_aumen@nps.gov	X	X
Fabian Kahn	ENP	375/242-7863	fabian_kahn@partner.nps.gov	X	X
Fred Mindermann	ENP	305/242-7822	fred_mindermann@partner.nps.gov	X	X
George Schardt	ENP	305/242-7816	george.schardt@enp.gov	X	X
Russ Frydenborg	FDEP	850/245-8063	russel.frydenborg@dep.state.fl.us	X	X
Joe Albers	SFWMD	561/753-2400, x4764	jalbers@sfwmd.gov		X
Holly Andreotta	SFWMD	561/753-2400, x4762	handreot@sfwmd.gov	X	X
Nikola Dзамov	SFWMD	561/753-2400, x4766	ndzamov@sfwmd.gov		X
Delia Ivanoff	SFWMD	561/682-2681	divanoff@sfwmd.gov	X	X
Megan Jacoby	SFWMD	561/753-2400, x4573	mjacobysfwmd.gov	X	X
Kristin Larson	SFWMD	561/753-2400, x4757	klarson@sfwmd.gov	X	X
Pam Lehr	SFWMD	561/682-2473	plehr@sfwmd.gov		X
Cheol Mo	SFWMD	561/682-2106	cmo@sfwmd.gov		X
John Moorman	SFWMD	561/682-2682	jmoorma@sfwmd.gov	X	X
Kevin Nicholas	SFWMD	561/753-2400, x4763	knichol@sfwmd.gov	X	X
Vyke Osmondson	SFWMD	561/753-2400, x4767	vosmonds@sfwmd.gov		X
George Paluga	SFWMD	561/753-2400, x4768	gpaluga@sfwmd.gov	X	X
Nathan Ralph	SFWMD	561/753-2400, x4769	nralph@sfwmd.gov	X	X
Sherry Scott	SFWMD	561/753-2400, x4674	sscott@sfwmd.gov		X
Bob Stickler	SFWMD	561/753-2400, x4774	rstickler@sfwmd.gov	X	X
Manuel Zamorano	SFWMD	561/753-2400, x4652	mzamoran@sfwmd.gov	X	X
Matt Harwell	USFWS	561/735-6005	matthew_harwell@fws.gov	X	X
Serena Rinker	USFWS	561/735-6029	serena_rinker@fws.gov	X	X
Robert Smith	USFWS	561/735-6027	robert_v_smith@fws.gov	X	X
Tiffany Trent	USFWS	850/723-2921	tiffany_trent@fws.gov	X	X
Bill Miller	USFWS	561/735-6039	william_g_miller@fws.gov	X	X
Mark Barrett	USFWS	561/735-6025	mark_barrett@fws.gov	X	X
Mike Waldon	USFWS	561/735-6006	mike@mwaldon.com		X
Donatto Surratt	USFWS	561/735-6003	donatto_surratt@fws.gov	X	X

Discussion Highlights

Marsh Sampling Protocol

- Russ Frydenborg presented an overview of the FDEP marsh sampling protocol which is intended to produce samples of the undisturbed water column representative of the marsh conditions without introducing any contamination. An audit checklist specific to this protocol was distributed to participants. He also gave an overview of some of the common vegetation found in the Refuge.
- The definition of “representativeness” was discussed at length with differing interpretations as 1) representative of marsh conditions on the day of sampling, 2) representative of the bulk water flow, or 3) representative of long-term marsh conditions. Clarification of the definition of “representativeness” may be needed from the Technical Oversight Committee (TOC). Non-representative data should be flagged in the database and not used for compliance purposes. It would be helpful to set firm criteria for flagging data (e.g., very high total suspended solids [TSS]).
- It was agreed that field sampling staff may not have the expertise or the time to assess the representativeness of a sample at the time of collection. The need for a clear guideline was discussed. If the Tdepth (depth of the water column) is at least 10 centimeters, a sample of the water column should be collected with minimal disturbance of the floc layer. If an area is disturbed and does not appear representative, the field technician should carefully move to another location 10-25 meters away. It should not be necessary to sample within the boundaries of the 4 poles used to mark the sampling stations.
- Any unusual conditions should be documented in the field notes (e.g., “no distinguishable water column”). Standardized field data entry forms in a checklist format are recommended with space for additional comments. A table summarizing example descriptions of various field conditions would also be a helpful reference for field staff. Although it would not be possible to anticipate every possible variation of field conditions, descriptions of extreme endpoints and a series of intermediate points could be compiled for reference.
- The current practice of filling large (2-liter) bottles at mid-depth is more likely to entrain floc and should be discontinued. Less disturbance would occur with smaller bottles filled near the water surface. The larger bottles are used to collect adequate sample volume for an extensive parameter list.
- The practice of submersing a capped bottle into the water column, based on the Marsh Sampling Protocol, is not a good practice in this type of sampling. The difficulty of uncapping and using both hands can further cause disturbance of the floc.
- Sampling at mid-depth should also be changed to sampling 5-10 cm below the surface, which is visible to the sampler. A controlled study using a peristaltic pump to collect samples at 5, 10, and 15 centimeters (cm) could be used to evaluate the potential impact of sample depth on water quality.
- Any significant changes to the sampling protocol (bottle size or parameter list) should be reviewed and approved by the TOC. Data collected using the new method should be compared with historical data.

- Russ Frydenborg advised that dissolved constituents should be processed within 15 minutes of sample collection for accuracy of phosphorus and nitrogen parameters. Currently, samples are processed in the lab within 4 hours to minimize delays in the field and excessive helicopter charges for standby time.
- Over time, holes in the sediment column are created by the sampler by merely walking through the marsh to the sampling location. Eventually, there are too many holes within the designated perimeter. FDEP recommended keeping only one pole marker at each sampling station and allowing the sampler to decide on the specific sampling location using GPS coordinates.
- The issue of installing boardwalks (i.e., sampling platforms) was discussed. Some sampling problems may be resolved by switching to smaller bottles and may eliminate the need for boardwalks.

Current Monitoring Plan

- Joe Albers distributed copies of the revised monitoring plan and a PowerPoint presentation highlighting the monitoring plan changes. The monitoring plan replaces the previous monitoring plan (December 2004) and the SOP for Water Conservation Area 1 (WCA 1) (March 2005). The objectives of the new monitoring plan were to eliminate redundancy, eliminate inconsistencies, clarify ambiguities, and reduce the effort to maintain field guidance documentation.
- The updated monitoring plan includes the following sampling highlights:
 - No disturbance induced by helicopter within 10 meters (m) of sampling location
 - Sampling from helicopter pontoons only if depth to consolidated substrate (DCS) > 1 m
 - Both field technicians should be present at the sampling location
 - Collect sample for TP only if Tdepth is 10-20 cm
 - DCS definition clarified
- The updated monitoring plan includes the following documentation highlights:
 - A new field log sheet was developed with additional information
 - Waterproof paper is used for COC forms and field log sheets
 - Document reasons for deviation from sequence of sampling stations
 - Document reason for sampling from helicopter pontoon
 - Document observed impacts of sampling from pontoon
- Field sheets could be changed from portrait to landscape layout to provide more room for comments.
- Russ Frydenborg recommended not removing the cap from sampling bottles underwater. Less disturbance is likely by reaching out and submerging the open sample bottle. (Note that this recommendation differs from the procedure proposed by FDEP in 1996. FDEP revised the recommendation for rinsing bottles in 2002.)
- Russ Frydenborg also commented that it is not necessary to rinse sample collection bottles in the field if they have been cleaned in the lab. Rinsing bottles at the sampling stations may result in disturbing floc and collecting a non-representative sample of the bulk water column.
- Measurement of the DCS can be subjective and difficult to measure consistently. The DCS is an important measurement to justify collection of a small number of

samples when it may appear on the surface that there is “a lot of water” in the marsh. However, use of a penetrometer or other sophisticated equipment may not be warranted or practical with space limitations on the helicopter. A 1 ½ m PVC pipe with a white tip and holes drilled to minimize buoyancy should be adequate for measuring DCS. George Paluga (District) will develop a prototype for a PVC pipe depth measuring instrument.

- Bill Walker’s paper (Analysis of Marsh Phosphorus Data from Loxahatchee National Wildlife Refuge, March 11, 1999) should be added as a reference for the 10 cm sampling depth cut-off.
- The issue of properly designating collected blanks was discussed. Currently, a field cleaned equipment blank (FCEB) is collected during sample processing in the laboratory. Due to difficulty and weight limitations in the helicopter, blanks are not collected in the field. (Suggestion: change name from FCEB to processing blank.) Russ Frydenborg indicated that samplers should also be collecting field blanks (FBs). If the recommendation to collect a smaller sample volume is approved, weight limitations for additional sample bottles may no longer be an issue.

QA/QC Requirements

- John Moorman presented an overview of the QA/QC requirements for marsh sampling and provided definitions for the following types of QC samples:
 - Equipment blank (EB)
 - Field cleaned EB (FCEB)
 - Field blank (FB)
 - Split sample (SS)
 - Replicate sample (RS)
- Consider changing designation of FCEB to processing blank, since it is not really collected in the field and the current term could cause confusion.
- Add/collect field blanks.
- Replicate samples (RS) are the same as field duplicates in DBHydro. Field duplicates refer to 2 samples collected at the same station and replicate samples refer to 3 or more samples collected at the same station. Samples are entered in the lab with the same batch number and a different sample number.
- Replicate samples are mostly collected from S5A, which has more volume available. Russ Frydenborg and Delia Ivanoff indicated that since the majority of the stations are in the interior marsh, replicate samples should be collected within the marsh.
- There was a brief discussion on interpreting the results of RS. (Specifically, how does one distinguish between natural variability vs. sampling variability?)
- There was a brief discussion on the procedure for SS collection. The current practice of rapidly and alternately filling split bottles is acceptable as demonstrated by achieving comparable results between FDEP and District laboratories.
- Currently, a supervisor signs off on a field technician’s capability after at least 2 satisfactorily demonstrated sampling trips at the Refuge. FDEP’s Stream Condition

Index training program requires a field visits to minimum of 8 stations and a 2-hour audit. Trained FDEP field staff are listed on FDEP's website.

- Field technicians are instructed to record actual instrument readings for specific conductivity, pH, etc. to avoid rounding errors in the field. Data can be rounded to an appropriate number of significant figures in a spreadsheet after uploading field data.
- Samples are currently filtered in the lab with a 4-hour holding time instead of filtering at the site to save time in the field. Russ Frydenborg commented that a 4-hour holding time is not valid for some filtered parameters such as orthophosphate. Filtering samples in the field is preferred but may not be practical. The current sample preparation practice was developed about 10 years ago. Validation studies would be required to change the current practice.

Challenges and Difficulties in Sample Collection

- Kristin Larson presented a video showing helicopter access and sample collection techniques at stations LOX11 and LOX4. A marsh sampling equipment checklist and a condensed SOP were distributed to attendees for quick reference in the field.
- Field technicians shared the following tips for marsh sampling:
 - Use the field equipment list and condensed SOP for reference
 - Use old field notes and header sheets for reference
 - Properly maintain multiparameter instruments and bring along backup equipment in case of equipment failure
 - Change membrane of dissolved oxygen (DO) probe on the Hydrolab, if pre-calibration reading is way off; similarly, replace electrolyte of pH probe
 - Actively instruct helicopter pilot where to land (pilot is only responsible for avoiding an unsafe landing location)
 - Clearly describe site conditions vs. sample conditions
 - Label bottles clearly to avoid preservation errors
 - Check with lab if a smaller sample volume is acceptable
 - Include time of sample collection on bottle
 - Label sample and blank correctly
 - Inspect bottles and discard if cracked or damaged
 - Take extra bottles to replace damaged bottles
 - Put away hat during sampling to avoid interference with helicopter

Open Discussion on Improvement Areas and SOP Refinements

- The following general improvement areas were discussed:
 - Guidance is needed to differentiate between suspended solids and settled material.
 - Guidance is needed to clarify the number of depth measurements that should be taken.
 - "Representativeness" should be clearly defined with descriptions of endpoints and middle ground.
 - The monitoring plan should be revised to allow for "best professional judgment."

- The requirement to rinse sample containers 3 times in the field should be eliminated. Bottles must be properly washed in the lab or purchased new and pass QC prior to use.
 - Helicopter distance from the sample location should be clearly defined.
- Field notes should include a description of the “visible nature of the water” including any common plants (e.g., cattails) present. A standardized field sheet is recommended with sufficient space to include detailed observations.
- Gloves are recommended, but not required by FDEP, for marsh sampling. Sampling without gloves could result in contamination from sun screen, insect repellent, or perspiration. Short gloves may not provide adequate coverage for sampling at mid-depth. Field sampling staff may want to utilize shoulder-length gloves when performing direct grab sample collections.
- Laundry detergent from clothing could also introduce contamination (e.g., phosphates).
- Clarification of language is needed for standard description of suspended solids and sample color.
- If solids in a sample settle in less than 4 hours, the sample probably contains floc stirred up in the field. It may be difficult to confirm whether the water was disturbed by the sampling process or by wind or other natural events and, therefore, whether or not the sample should be considered “representative of marsh conditions.”
- Observations of turbidity are subjective and may differ in the field and in the lab. A turbidity sensor could be added to the hydrolab but it may not resolve the issue. If turbidity appears lower approximately 2 m away from the sampler, the turbidity is likely due to disturbance from the sampling activity.
- This workshop was recommended by the TOC in July 2005 to avoid the need to flag data on future sampling events. Field staff are “the eyes and ears” of the agencies involved in Everglades restoration. An independent assessment of competence is needed to ensure that field sampling crews have sufficient experience and training to identify normal and abnormal conditions.
- Additional information on marsh sampling and other TOC issues is available on the TOC website (<http://www.sfwmd.gov/org/ema/toc/index.html>).
- The Refuge is more like a pond with no apparent flow. Therefore, it may be difficult to collect samples that are “representative of bulk water flow”.
- Hammerhead computers are currently used by District staff to record header sheet entries in the field. Digital recorders or cameras could also be used, if available, to record site observations.
- There was brief discussion on training and certification of training, what constitutes training, and how a sampler would be certified.

Public Comments

Public comment cards were made available for submittal of public comments during or after the meeting. No public comments were received.

Action Items

The action items identified during the workshop are summarized in Table 2 below.

Table 2. Action Items for Marsh Sampling Workshop (September 26, 2005)

Action Item	Responsibility
Email latest version of monitoring plan to attendees	Joe Albers
Provide review comments on monitoring plan.	All
Compile a table of descriptions of typical marsh conditions to include in field notes.	Matt Harwell
Prepare a matrix of unusual conditions and expectations of the sampler.	Delia Ivanoff/Kristin Larson
Prepare a mini-Quality plan for use in the field.	
Discontinue the practice of 3x rinsing of containers with site water.	Sampling personnel
Fabricate a PVC prototype for DCS measurement.	George Paluga
Prepare a list of common plants found in the Refuge for reference in field notes.	Russ Frydenborg
Provide recommendations for revised sample volume and parameter list to the TOC.	Joe Albers
Schedule a follow-up workshop to discuss field processing methods.	Delia Ivanoff
Conduct special study on sampling depths, comparing sampling at mid depth vs. 5-10 cm from the surface.	To be determined
Present other suggested changes to TOC.	Delia Ivanoff

Next Meeting

Delia Ivanoff will schedule a follow-up workshop to discuss field processing methods. All attendees of the September 26th workshop will be notified when the date has been confirmed.

DOI Comments on Meeting Summary for the Marsh Sampling Workshop

Attached are compiled technical comments from workshop attendees:
Matt Harwell, Nick Aumen, Mike Walden, Donatto Surratt
and submitted at the October 18th, 2005, TOC Special Meeting.

Comments on:

draft Meeting Summary of the Marsh Sampling Workshop on September 26, 2005 (prepared October 6, 2005 by Delia Ivanoff and Pam Lehr)

These are compiled technical comments from workshop attendees:
Matt Harwell, Nick Aumen, Mike Waldon, Donatto Surratt

General

- 1) The notes from this workshop are valuable in helping us capture the content of the discussions that took place with the experienced field staff. The draft notes do a good job of capturing a significant amount of the information discussed; however, there are instances where additional clarification in the notes will improve them. One general area where more text is needed involves the contributions to discussions made by DOI staff. Several areas are identified below in the specific comments.
- 2) The meeting summary should clearly state that the suggestions listed were made by individuals and were discussed at the workshop, but they are not necessarily a consensus recommendation from the work group back to the TOC or others.
- 3) We need to provide clear guidance on what sampling crews should do when they determine that there is greater than 10 cm of water, and that suspended sediments in the water seem to be representative of the sampling area.
- 4) We should insure that any changes in sampling techniques should be based on data where possible, and not just on individual judgment.
- 5) If at any time we collectively determine the need for a small-scale study to be conducted to help refine sampling techniques, we will report to our Principals the need for resources to conduct such a study.
- 6) One item missing from these notes is mention of how this fits into the training needs/requirements for field crews (e.g., certificate of attendance, actual training, etc.).

Specific

- 1) p. 2, Table 1: George Schardt contact is: george_schardt@nps.gov
- 2) p. 3, Marsh Sampling Protocol, 2nd bullet: "*Non-representative data should be flagged in the database and not used for compliance purposes.*" This statement may be appropriate for FDEP's regulatory compliance, but not for TOC purposes. The CD states that all data are to be examined. Although there is technical overlap and individual interest, TOC's oversight role is on research and monitoring related to CD compliance.

Flagging or not flagging data is not an aspect of sampling. The sampling team should follow the written protocol when sampling. If "non-representative" is defined as a certain deviation from a historical record, then we disagree. Such flagging is inappropriate for TOC purposes because compliance levels are based on concentrations that are expected to only rarely be exceeded under the hypothesis of no degradation from the base period. Thus, throwing out unusually high values would greatly reduce the power of the compliance test to identify violations.

Important point: caution is needed in making general statements that have specific implications.

- 3) p. 3, Marsh Sampling Protocol, 2nd bullet: "*It would be helpful to set firm criteria for flagging data (e.g., very high total suspended solids [TSS]).*" This topic was discussed at the workshop; however, the conclusion was that more was needed to be examined to make recommendations of this nature.
- 4) p. 3, Marsh Sampling Protocol, 3rd bullet: Add to end of last sentence, "as long as it is recorded" as this was discussed at the workshop.
- 5) p. 3, Marsh Sampling Protocol, 5th bullet: "*The current practice of filling large (2-liter) bottles at mid-depth is more likely to entrain floc and should be discontinued.*" This was discussed at the workshop; however, the discussion focused on recognition that any changes in sampling techniques should be based on data where possible, and not just on individual judgment.
- 6) p. 3, Marsh Sampling Protocol, 7th bullet: "*Sampling at mid-depth should also be changed to sampling 5-10 cm below the surface, which is visible to the sampler.*" This was discussed in detail at the workshop. The notes should reflect that this was actually a recommendation for further consideration.
- 7) p. 4, Marsh Sampling Protocol, 9th bullet, on dissolved constituents: The notes need to reflect the discussion about the interactions between holding time and how samples are preserved on ice during collection. The discussion at the workshop recognized the need to examine data on this issue (or design a small-scale study if needed).
- 8) p. 4, Marsh Sampling Protocol, 11th bullet, on boardwalks: Other issues associated with boardwalks were discussed at the workshop and need to be captured in the notes. Specifically, there was a discussion about the limitations of sampling from boardwalks, including issues related to representativeness of the sample collection and what to do if no water immediately there.

- 9) p. 4, Current Monitoring Plan, 2nd bullet: At water depths between 10 and 20 cm, the following parameters are measured: Temperature, specific conductivity, pH, TP, Cl, and DO.
- 10) p. 5, QA/QC Requirements, 8th bullet, on capability: The discussion on “certification” of field personnel to collect samples did not result in a specific conclusion. Up until the day of the workshop, Refuge personnel were told that the workshop would function as the field collection training portion. In fact, Refuge personnel repeatedly asked for this and requested that the workshop approach for training be split into separate days for field and laboratory training to provide the attention required.
- 11) p. 5, QA/QC Requirements, 10th bullet, on holding time: Same comment as #7 above, in which examination of data, rather than personal judgment, is the appropriate mechanism to examine this issue.
- 12) p. 6, Open Discussion: There are several big-picture topics identified in this section that was discussed at the workshop as having a need for more specific attention. These should be highlighted and captured in the Action Items section. These include:
- representativeness (1st bullet)
 - differentiation between suspended solids/color/settled material (bullets 1, 5, 6)
 - additional guidance on use of best professional judgment by field crew (1st bullet)
- 13) p. 8, Action Item Table, row 3 on typical marsh conditions characterization: This is coupled to discussions on representativeness and site characterization (vegetation) and should be directed by staff doing the sampling in the field.
- 14) p. 8, Action Item Table, row 8 on sample parameters for elimination: It is vital that this exercise involve discussion of both issues involved with bottle size, and (more importantly) the parameters themselves. A specific effort needs to examine the data to determine whether or not a particular parameter is valuable.